2304M216

Candidate's Seat No :_____

M.B.A. GM (OM) Semester-4 Examination

OM-406

OR

Time : 2-30 Hours]

April-2024

[Max. Marks : 70

Q-1	**A)** What is operations research? Give the various definitions of operations research.	14
Q-2	**A)** A company has factories at A, B, C which supply warehouses at D, E, F and G. Monthly factory capacities are 160, 150 and 190 units respectively. Monthly warehouse requirements are 80, 90, 110 and 160 units respectively. Unit shipping costs are given in Table. Determine the optimum distribution for this company to minimize shipping cost.	14

Unit shipping cost

To ↓ From→	D	E	F	G
A	42	48	38	37
B	40	49	52	51
C	39	38	40	43

OR

B) (1) A machine is priced at ₹ 5000 and running costs are estimated at ₹ 800 for each of the first five years and increasing by ₹ 200 per year in the sixth and subsequent years. If the money is worth 10% per year, determine the year at which machine is replaced.

(2) Obtain the initial basic feasible solution by the inspection method for the following transportation table.

Destination						
Origin	D_1	D_2	D_3	D_4	D_5	Capacity
O_1	12	4	9	5	9	55
O_2	8	1	6	6	7	45
O_3	1	12	4	7	7	30
O_4	10	15	6	9	1	50
Requirement	40	20	50	30	40	

Q-3	**A)** For the following problem: Maximize $z = 3x_1 + 2x_2 + 5x_3$ Subject to the constraints: $\quad x_1 + 2x_2 + x_3 \leq 430 \quad (1)$ $\quad 3x_1 + 2x_3 \leq 460 \quad (2)$ $\quad x_1 + 4x_2 \leq 420 \quad (3)$ $\quad x_1 \geq 0; x_2 \geq 0; x_3 \geq 0$	14

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OR

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B) (1) A farmer is attempting to decide which of three crops he should plant on his one hundred acres firm. The profit from each crop is strongly dependent on the rainfall during the growing season. He categorized the amount of rainfall substantial, moderate or light. He estimated his profit for each crop as shown in table

Rain Fall	Estimated Profit (₹)		
	Crop A	Crop B	Crop C
Substantial (S)	7,000	2,500	4,000
Moderate (M)	3,500	3,500	4,000
Light (L)	1,000	4,000	3,000

Estimation of the probability of the substantial rainfall is as 0.2, that of the moderate rainfall as 0.3 and that of the light rainfall as 0.5. From the available data determine the optimal solution.

(2) Explain the following with respect to the linear programming: (Any Four)
   (a) Basic solution
   (b) Non-basic variables
   (d) Basic feasible solution
   (c) Degenerate basic feasible solution
   (d) Optimal solution
   (e) Extreme point

Q-4	**A)** Following table gives the values of t_o, t_m and t_p for each activity. Calculate the expected time, draw PERT chart and decide critical path. Also calculate EST, EFT, LST, LFT, Total Float, Free Float and Independent Float.	14

ACTIVITY	1-2	1-6	2-3	2-4	3-5	4-5	6-7	5-8	7-8
Optimistic Time	2	2	5	1	5	2	3	2	7
Most Likely Time	5	5	11	4	11	5	9	2	13
Pessimistic Time	14	8	29	7	17	14	27	8	31

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OR

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B) Find the sequence that minimizes the total time required in performing the following jobs on three machines in the order A–B–C as shown in table. Also find the total elapsed time.

Job / Machine	1	2	3	4	5	6
A	8	3	7	2	5	1
B	3	4	5	2	1	6
C	8	7	6	9	10	9

Q-5

A) Select correct option and write the answer.   14

1) Which of the following is not a characteristic of Operations Research (OR)?
   (a) Quantitative approach
   (b) Problem-solving orientation
   (c) Focuses solely on financial aspects
   (d) Interdisciplinary nature

2) In managerial decision-making, which aspect does Operations Research (OR) primarily focus on?
   (a) Short-term goals
   (b) Long-term goals
   (c) Immediate profit maximization
   (d) Reducing employee turnover Problem-solving orientation

3) In decision-making under uncertainty, what is the decision-maker unaware of?
   (a) It guarantees the best outcome
   (b) It simplifies the decision-making process
   (c) It provides a visual representation of the decision problem
   (d) It eliminates uncertainty

4) What is the main advantage of using a decision tree in decision-making under uncertainty?
   (a) Quantitative approach
   (b) Problem-solving orientation
   (c) Focuses solely on financial aspects
   (d) Interdisciplinary nature

5) Which of the following is NOT a component of the mathematical formulation of a linear programming (LP) model?
   (a) Objective function
   (b) Decision variables
   (c) Constraints
   (d) Exponential functions

6) In the simplex method in solving LP Problem, what is the initial basic feasible solution?
   (a) The solution with the highest profit
   (b) The solution with the lowest cost
   (c) Any feasible solution to start the iteration
   (d) The solution where all decision variables are zero except for a set of basic variables

7) Which method involves starting the solution process of the transportation problem with all allocation values set to zero?
   (a) North-West Corner Method
   (b) Least Cost Method
   (c) Vogel's Approximation Method (VAM)

(d) MODI method

8) What is the objective of the MODI (Modified Distribution) method in the transportation problem?
(a) To determine the optimal transportation cost
(b) To identify the least-cost route for transportation
(c) To minimize the number of iterations required
(d) To find the most unbalanced allocation

9) Which method is known for its ability to handle degeneracy in transportation problems effectively?
(a) North-West Corner Method
(b) Least Cost Method
(c) Vogel's Approximation Method (VAM)
(d) MODI method

10) Which algorithm is commonly used to solve the assignment problem optimally?
(a) Simplex method
(b) Hungarian algorithm
(c) Dijkstra's algorithm
(d) D) Bellman-Ford algorithm

11) What does the term "unbalanced assignment problem" refer to ?
(a) A problem where the number of agents is not equal to the number of tasks
(b) A problem with non-integer assignment values
(c) A problem with unbounded feasible solutions
(d) A problem with imbalanced assignment costs

12) What is the objective of the assignment problem?
(a) To maximize profit
(b) To minimize cost or time
(c) To optimize production capacity
(d) To balance resources

13) What is a zero-sum game?
(a) A game where the total payoff to all players is zero
(b) A game where one player's gain is another player's loss
(c) A game with no optimal strategy
(d) A game with infinitely many strategies

14) What does the minimax theorem state in game theory?
(a) Every finite, two-player, zero-sum game has an optimal strategy
(b) In a zero-sum game, the maximum payoff for one player is minimized
(c) Players should always cooperate for mutual benefit
(d) The outcome of a game depends solely on random chance